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Some necessary fine-tuning in the order Spirobolida (Spirobolidae, Messicobolidae, Atopetholidae)

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ABSTRACT

The following taxonomic and/or nomenclatorial changes are proposed: *Oxobolus* Chamberlin, 1922, as a subjective junior synonym of *Messicobolus* Brolemann, 1913; *Spirobolus reptans* Porat, 1889, is transferred from *Messicobolus* to *Hiltonius*, with *Spirobolus callipus* Bollman, 1893, as a subjective junior synonym; the gonopods of the type specimen of *Atopetholus californicus* Chamberlin, 1918, and *Hesperolus wheeleri* Chamberlin, 1918, are illustrated for the first time; the latter name is based on an immature male holotype and generic position thus uncertain although geographically the species is doubtless referable to *Atopetholus*; *Spirobolus vulvanus* Karsch, 1881, is transferred from *Cyclothyrophorus* to *Centrelus* and the gonopods of the male lectotype illustrated for the first time; the gonopods of *Cyclothyrophorus salvini* Pocock, 1908, are illustrated and the genus confirmed as an atopetholid taxon. *Atopetholus parvus* Chamberlin, 1918, is redescribed from the "lost" holotype and considered provisionally as type species of the nominal genus *Tidolus*. *Toltecolus* Chamberlin, 1943, is resurrected from the synonymy of *Centrelus* to accomodate the two species *garcianus* Chamberlin, 1943, and *fluvialis* Loomis, 1968.

APOLOGIA

During compilation of a checklist of the millipeds of North and Middle America, I encountered a variety of taxonomic and nomenclatorial problems that are better addressed in an advance publication than in the text of the list itself. Those which affect various taxa within the Spirobolida are treated in the following discussions.

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Family **Messicobolidae** Loomis

Messicobolidae Loomis, 1968, Bull. U. S. Nat. Mus., 266: 81.

Genus **Messicobolus** Brolemann

Messicobolus Brolemann, 1913, Bull. Soc. Ent. France, p. 32; 1914, Ann. Soc. Ent. France, 83: 32. Type species, *M. godmani* Pocock, by original designation.
Oxobolus Chamberlin, 1922, Proc. U. S. Nat. Mus . 60 (8): 30. Type species: *Oxobolus virilis* Chamberlin, by original description. **New Synonymy!**

Apparently *Oxobolus* has survived for over 70 years of usage solely by default. There is no evidence that Chamberlin evaluated the earlier name *Messicobolus* when he was preparing his 1922 paper, either from Brolemann's two publications or two well-illustrated treatments by Carl in 1918 and 1919. This is the more curious when it is noted that he did, however, cite Brolemann's 1914 "Essai" in connection with *Allopocockia tylopus* (cf. 1922: 34), which suggests that he *had* seen it.

In papers appearing later in his career, Chamberlin used both names to accomodate new species, but without ever, to my knowledge, making a distinction between them aside from that implied by their geographic provenence. *Messicobolus* was used for species collected in Mexico, *Oxobolus* for those from further south. Nor was the situation considered by other workers, e.g. Causey (1954) and Loomis (1966, 1968).

In comparing both specimens and literature accounts, I can find no differences whatever, at the generic level, between species placed in both the "genera" mentioned, and herewith consider *Oxobolus* a junior subjective synonym of *Messicobolus*.

Family **Spirobolidae** Bollman

Genus **Hiltonius** Chamberlin

Hiltonius Chamberlin, 1918, Proc. Biol. Soc. Washington, 37: 166. Type species: *H.pulchrus* Chamberlin, by original designation. – Keeton, 1960, Mem.American Ent. Soc., 17: 97.

Hiltonius reptans (von Porat), new combination

Spirobolus reptans von Porat, 1889, Ann. Soc. Ent. Belgique, 32: 250. Two female syntypes (Inst. Roy. Sci. Nat. Belg.) from Guanajuato [Mexico] (E. Duges leg.).
Spirobolus callipus Bollman, 1893, Bull. U. S. Nat. Mus., 43: 191.♂ and ♀ syntypes (formerly USNM, presumed lost), from Guanajuato, Mexico (E. Duges, leg.). **New synonymy!**
Spirobolus reptans: Pocock, 1908, Biol. Centr.-Amer., Diplop., p. 83.
Hiltonius callipus: Keeton, 1960, Mem. American Entom. Soc., 17: 114.
Messicobolus reptans: Loomis, 1968, Bull. U. S. Nat. Mus., 266: 84.

The species represented by the two names cited above has remained enigmatic for over a century but I think the veil of obscurity may be lifted by appeal to circumstantial evidence. Bollman's posthumously published description of *callipus* had been written prior to his death in 1889, thus he was unaware of Porat's account of *reptans*, based on material collected at the same place by the same person who obtained the types of *callipus*.

Insofar as I know, neither name has been mentioned in subsequent literature aside from Pocock's entry for *reptans* in the "Biologia" until Keeton (1960: 114) deduced that *callipus* was referable to *Hiltonius* and Loomis (1968: 84) arbitrarily located *reptans* in *Messicobolus*. Actually, Bollman's description is fairly precise and Keeton's interpretation was well-founded. But a point by point comparison of Bollman's text with that of Porat shows a remarkable concordance, which taken into consideration with the origin of the two type series, leaves little doubt that the two names are based upon the same species.

Family **Atopetholidae** Chamberlin

Information is provided here only to document several changes proposed in the 1980 "Classification".

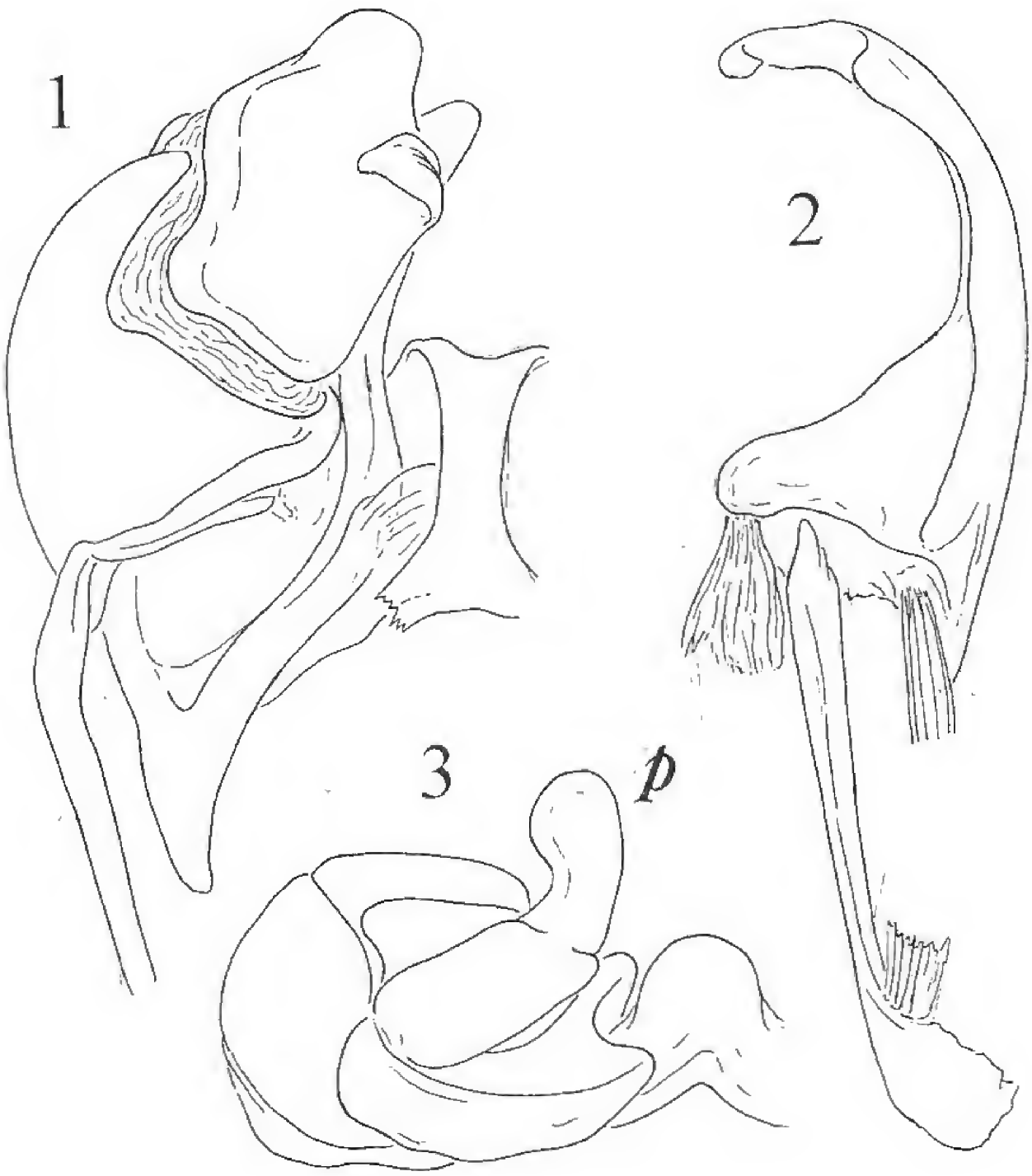
Genus **Atopetholus** Chamberlin

Atopetholus Chamberlin, 1918, Proc. Biol. Soc. Washington, 31: 167. Type species: *A.calfornicus* Chamberlin, by original designation.

Hesperolus Chamberlin, 1918, Proc. Biol. Soc. Washington, 37: 169. Type species: *H.wheeleri* Chamberlin, by original designation. - Hoffman, 1980, Classification of the Diplopoda, p. 77 (as junior synonym of *Atopetholus*) .

The identity and status of the two genera cited above remained inferential ever since their proposal, since the type species of both were not illustrated and the type material itself was missing from the Museum of Comparative Zoology, the ostensible depository.

However, following the demise of Professor R. V. Chamberlin and transfer of his myriapod collections to the U. S. National Museum of Natural History, the entire material of Diplopoda was placed in my hands for curation and organization. During this activity a considerable number of types long missing from several museum collections and feared to be lost, began to emerge from the interiors of large jars of miscellaneous samples (I am convinced that Prof. Chamberlin forgot that he even had such material). I took the occasion to study and illustrate many of these specimens before returning them to the rightful owner museums, and among the number were several of the enigmatic atopetholids published in the 1918 paper.

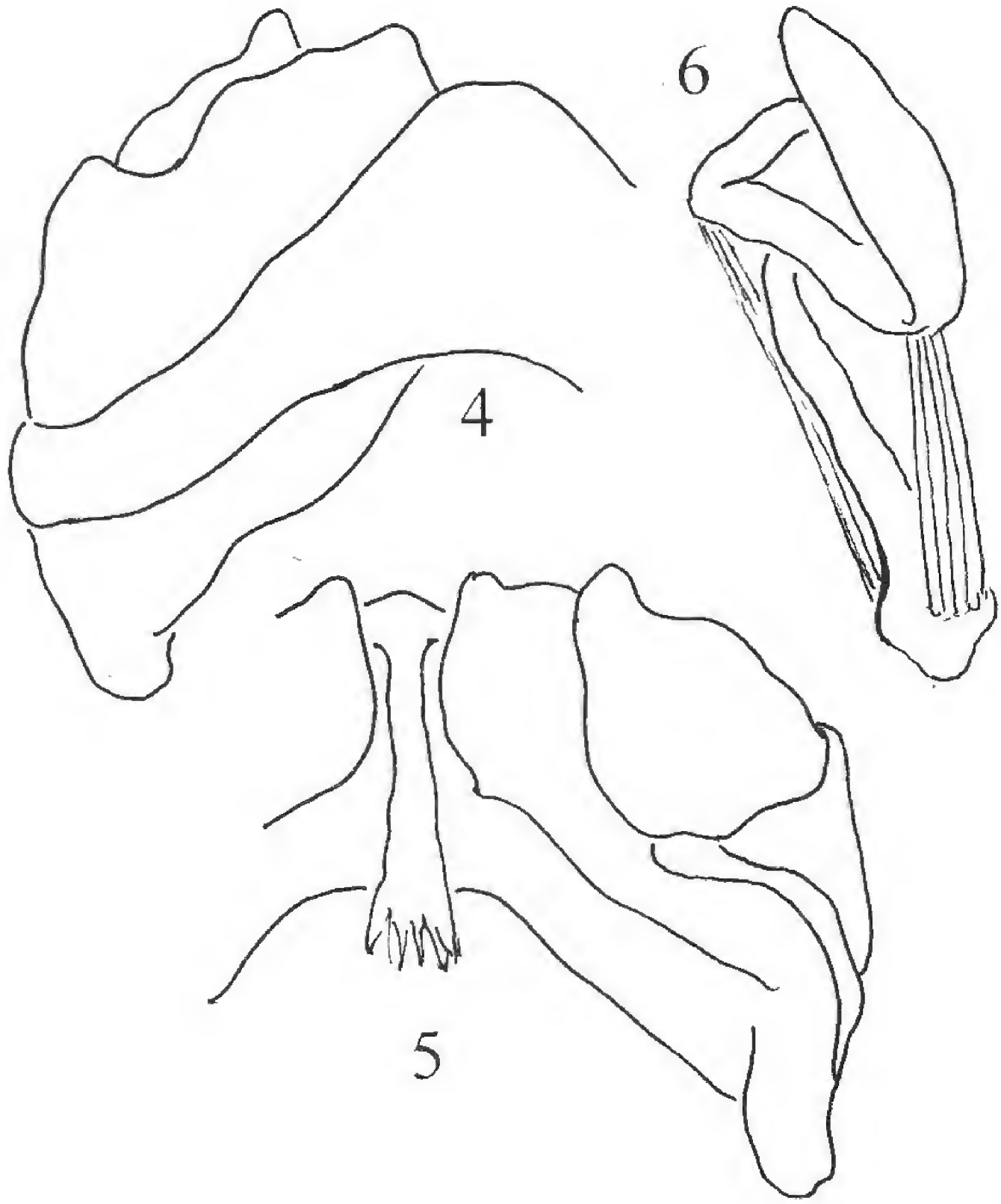


Figs. 1-3. *Atopetholus californicus* Chamberlin. 1, right side of anterior gonopods, posterior aspect. 2, left posterior gonopod, posterior view. 3, left side of anterior gonopods, ventral aspect, showing shape of telopodite process (p). Drawings from holotype.

I provide here gonopod drawings for the type species of both generic names listed above. By good fortune, *A. californicus* is clearly congeneric with the various species subsequently described in this genus but not conspecific with any of them, as indicated by the details shown in Figures 1-3.

We are less fortunate in the case of *Hesperolus wheeleri*. The male holotype proved to be immature, and the gonopods show little more than family level features. The provenance of the specimen (Santa Ynez Mountains, California) from a region

so far known to be inhabited by only one genus of atopetholids suggests that *wheeleri* will prove to be an *Atopetholus* when mature male topotypes have been studied. For possible confirmatory value. I give here drawings made from the holotype (figs. 4-6).



Figs. 4-6. *Hesperolus wheeleri* Chamberlin. 4, left side of anterior gonopods, anterior aspect. 5, left side of anterior gonopods, posterior aspect. 6, posterior gonopod, posterior aspect.

Genus **Centrelus** Cook

Centrelus Cook, 1911, Proc. U. S. Nat. Mus., 40: 154. Type species: *C. falcatus* Cook, by original designation.

Saussurobolus Carl, 1918, Rev. Suisse Zool., 27: 389. Type species: *Julus nietanus* DeSaussure, 1860, by original designation. Synonymized by Hoffman, 1980.

Nec: Centrelus, sensu Hoffman & Orcutt, 1960: 123, and Loomis, 1968: 79.

The holotype of *C. falcatus*, mentioned as missing from the USNM collection already in 1960, has never been located, mandating the collection of topotypes at Guanajuato, Mexico for an definitive concept of the status of this species and the genus based on it.

Hoffman & Orcutt (1960: 123) attempted to reconcile the verbal account of *Centrelus* with some of the atopetholids then known to them, with completely incorrect conclusions. Subsequent experience with Mexican atopetholids led, during preparation of the "Classification" in 1978, to a complete reconsideration of the two names cited above, taking into account structural features mentioned by the two authors as well as biogeographic probabilities, led me to propose the indicated generic synonymy. As a result, the generic name *Toltecolus* (Chamberlin, 1943) was revived for the species treated as *Centrelus* by Hoffman & Orcutt (1960) and Loomis (1968) (it is a curious fact that Loomis consistently misspelled the name as *Centrellus* in several papers, although using the single "l" in correspondence).

Although the examination of male topotypes of *falcatus* from Guanajuato is prerequisite for a final disposition of the name, it now appears that about eight nominal species can be referred to *Centrelus*, on the basis of the elongated coxal processes of the 3rd leg pair and simple "canoe-shaped" telopodites of the posterior gonopods. A list of these species is given below to establish the new combinations. I think it likely that *zacatecus* may be removed to a different genus when the gonopods have been examined carefully, and the same may be true for *nigrescens*.

Species: *C. boreus* (Loomis, 1966); *C. falcatus* Cook, 1911; *C. neglectus* (Carl, 1919); *C. nietanus* (DeSaussure, 1860); *C. nigrescens* (Chamberlin, 1923); *C. spinosus* (Loomis, 1968); *C. vulvanus* (Karsch, 1881), and *C. zacatecus* (Chamberlin, 1947).

Centrelus vulvanus (Karsch), new combination

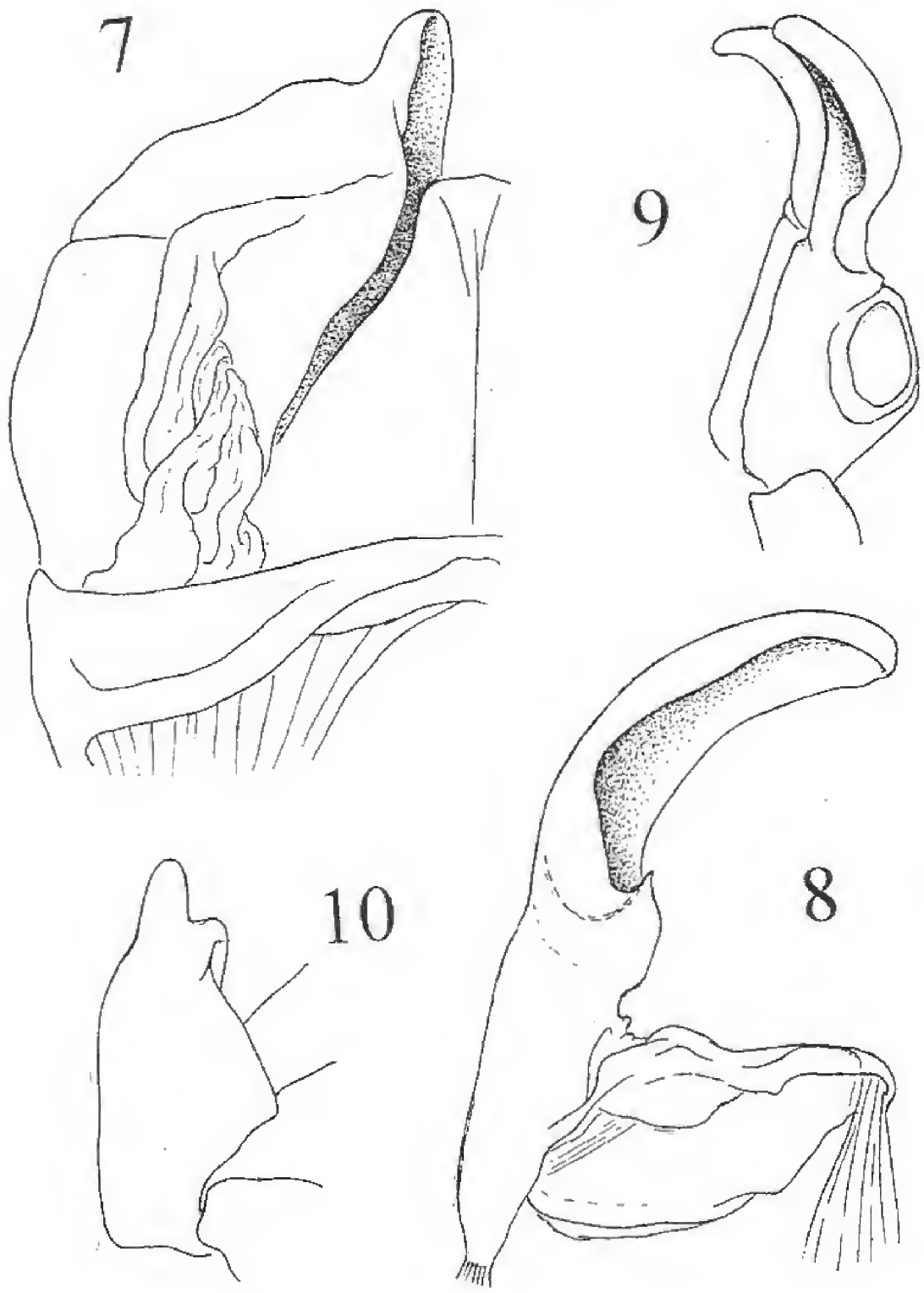
Figures 7-10.

Spirobolus vulvanus Karsch, 1881, Zeitschr. Ges. Naturwiss. (3) 6: 55. 2♂♂ 1♀ ST (ZMB 882, *vidi!*) from Puebla (probably the city), Mexico. One of the males has been isolated and labeled as the **lectotype,** the other two specimens as lectoparatypes.

Cyclothyrophorus vulvanus: Pocock, 1908, Biol. Centr.-Amer., Diplopoda, p. 86.

Cyclothyrophorus valvanus [sic!]: Loomis, 1968, Bull. U. S. Nat. Mus. 266, p. 80.

Working only from Karsch's verbal description, Pocock showed remarkable insight in considering this species to be closely related to DeSaussure's *Spirobolus nietanus*, which he likewise knew only from a short description. Gonopod drawings that I made from the lectotype of *vulvanus* indicate that the posterior gonopods are very similar to those of *nietanus* as illustrated by Carl (1919: fig. 16), and the relative



Figs. 7-10. *Centrelus vulvanus* (Karsch). 7, right side of anterior gonopods, anterior aspect. 8, left posterior gonopod, posterior aspect. 9, coxae and coxal processes of 3rd pair of legs, oblique posterolateral aspect. 10, coxa of 4th pair of legs, posterior aspect. Drawings from lectotype, fig. 9 enlarged.

proximity of Puebla to Cuernavaca admits the possibility that the two names are synonyms.

The superficial similarity of the coxal processes of the third legs to the posterior gonopods is noteworthy: both appendages are simple, falcate, and deeply concave on one surface.

The anterior gonopods (Fig. 7) are notably for the extensive development of membrane on the anterior surface of the coxae, the distinct separation between the transverse element of the sternum and the ventrally-produced median triangular part. An especially curious feature is the apparent coalescence of the coxa with the telopodite (unless it can be demonstrated that the coxa is bounded medially by the abundant membranous folds, in which case the telopodite would be unusual for its long proximal extension beside the sternum)

The elongate apical processes of the 3nd coxae of males, curved posteriad and concave on their posterior side, are illustrated (Fig. 9).

Genus **Cyclothyrophorus** Pocock

Cyclothyrophorus Pocock, 1908, Biol. Centr.-Amer. Diplopoda, p. 83. Type species: *C. salvini* Pocock, by original designation.

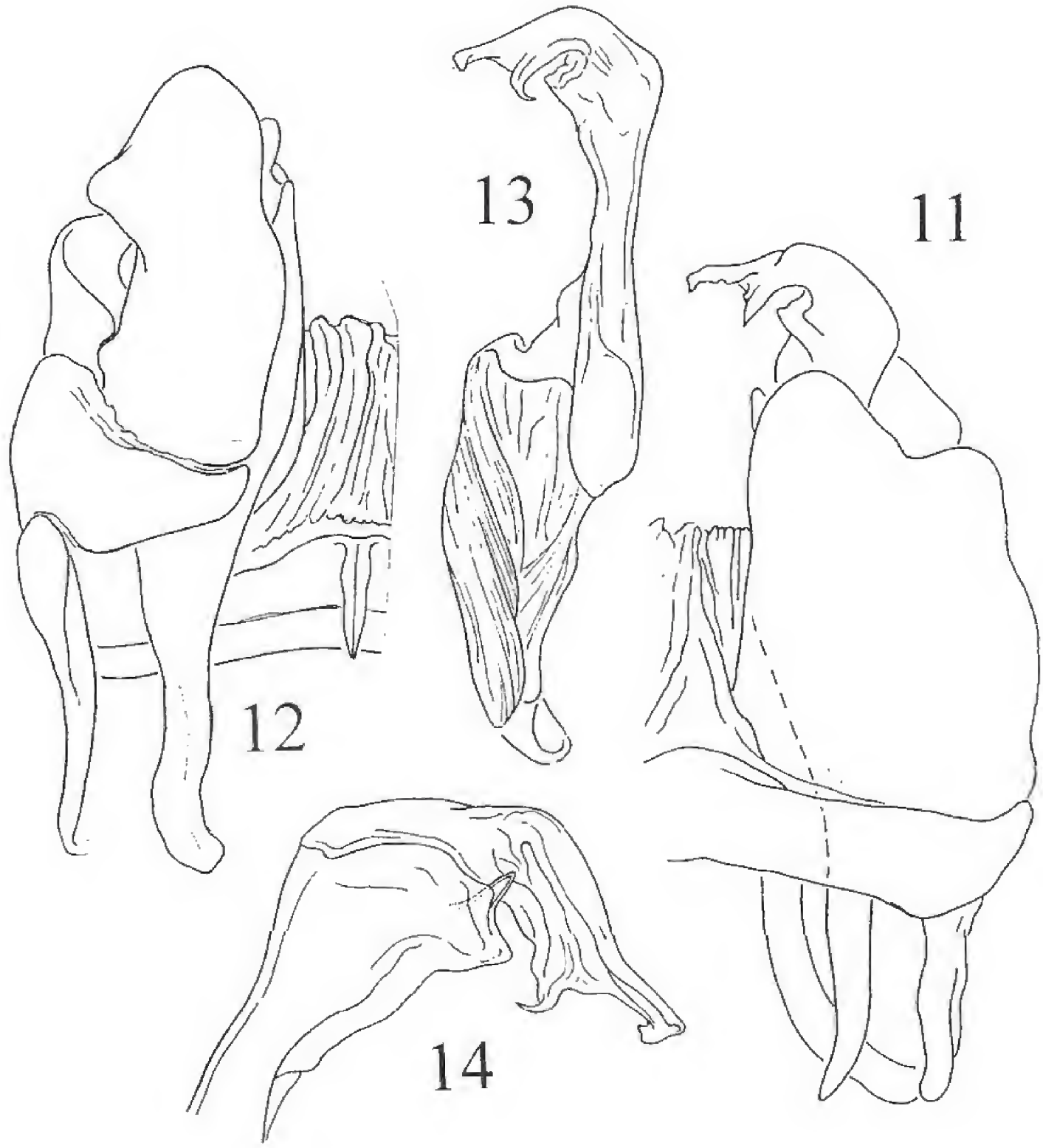
This genus of somewhat unusual atopetholids has been essentially an orphan for most of its existence, not being assigned to its correct family until the 1968 Checklist by Loomis. Working solely from Pocock's original description. Hoffman & Orcutt (1960: 113) decided that the genus was either not an atopetholid or a member of a disjunct subfamily group. But only a few years later, I received freshly collected material from Colima which agreed very closely with Pocock's account of *C. salvini*, and which permitted a close examination of gonopod structure. On becoming convinced that the species is in fact an atopetholid, I transmitted the information to Mr. Loomis, who was at that time compiling his 1968 Checklist, and *Cyclothyrophorus* thereupon came to rest in its correct position.

Pocock had included three other Mexican spiroboloids in his genus, entirely on the basis of published verbal descriptions. One of them, *Julus nietanus* DeSaussure, was later redescribed by Carl (1919: 390), who designated it the type species of the new genus *Saussurobolus*. The second, *Spirobolus heteropygus* DeSaussure & Humbert, was never mentioned by Carl (although the type material must also have been at Genève), and in the lack of definite information, the species was allowed to phorese as a species of *Cyclothyrophorus* in the Loomis Checklist (1968: 80). The third was *Spirobolus vulvanus* Karsch, described from Puebla and never mentioned by anybody after Pocock's diffident inclusion, until Loomis continued its sojourn in *Cyclothyrophorus*. Eventually I studied the male holotype in the Berlin museum, and found that this species is probably referable to *Centrelus, q.v.* the species entry above under that genus..

Although the gonopods embody the traditional atopetholid characteristics, the

combination of extensive, lightly sclerotized intercoxal membrane and the apically enlarged and ramose posterior gonopod imparts a distinctive generic personality to *C. salvini*. Despite special attention to the point, I was unable to establish the occurrence of a prostatic groove, or its equivalent, on the posterior gonopod.

Cyclothyrophorus salvini Pocock
Figures 11-14



Figs. 11-14. *Cyclothyrophorus salvini* Pocock. 11, right gonopods, anterior aspect. 12, right gonopods, posterior aspect. 13, left posterior gonopod, posterior aspect. 14, the same gonopod, apical third enlarged, anterior aspect.

Cyclothyrophorus salvini Pocock, 1908, Biol. Centr.-Amer., Diplopoda, p. 84, pl. 7, figs. 6a-d. Type material presumed lost, from Amula, Edo Guerrero, Mexico. – Loomis, 1968, Bull. U. S. Nat. Mus. 266: 80.

Like most of the new millipeds described in the "Biologia" after Pocock's career change (to become superintendent of the London zoo), the types (and only known specimens of this species) were never returned to the British Museum and have to be considered as lost. In 1968 it was my good fortune to receive extensive collections of Mexican millipeds from Drs. G. E. Ball and D. R. Whitehead, and this material contained several males which matched the original description of *salvini* in every respect. Gonopod illustrations made from one of the males (from 19 miles north of Ciudad Colima, July 26, 1963, in VMNH) are reproduced here as Figures 11-14.

Despite previous doubts (Hoffman & Orcutt, 1960: 113) about the correct placement of *Cyclothyrophorus*, the Colima material was adequate to demonstrate the atopetholid facies of the type species.

The Colima population extends the known range of *salvini* approximately 400 km northwest along the Sierra Madre del Sur.

Genus **Tidolus** Chamberlin

Tidolus Chamberlin, 1949, Journ. Washington Acad. Sci., 43: 169. Type species: *Atopetholus parvus* Chamberlin, 1918, by original designation.

The generic diagnosis of this taxon was based solely upon the brief verbal description of *A. parvus* published in 1918, and without better knowledge of the gonopod structure, was essentially meaningless. Ironically, it appears that Professor Chamberlin actually had the holotype of *parvus* in his possession since the mid-1920s, misplaced in a large jar of miscellaneous material taken away from the Museum of Comparative Zoology.

When curating the diplopod material after its transfer to the National Museum of Natural History, I eventually came across this specimen and made some drawings of the gonopods before returning it to the Harvard museum. It is clear that *parvus* - lacking the accessory process on the telopodite of the anterior gonopod - is not a species of *Atopetholus* It is less obvious how the species, and its nominal genus, remain to be distinguished from other regional genera such as *Watichelus*. Pending a revision of the family, I recognize *Tidolus* provisionally as a valid monotypic genus.

Tidolus parvus (Chamberlin)

Figs. 15-18

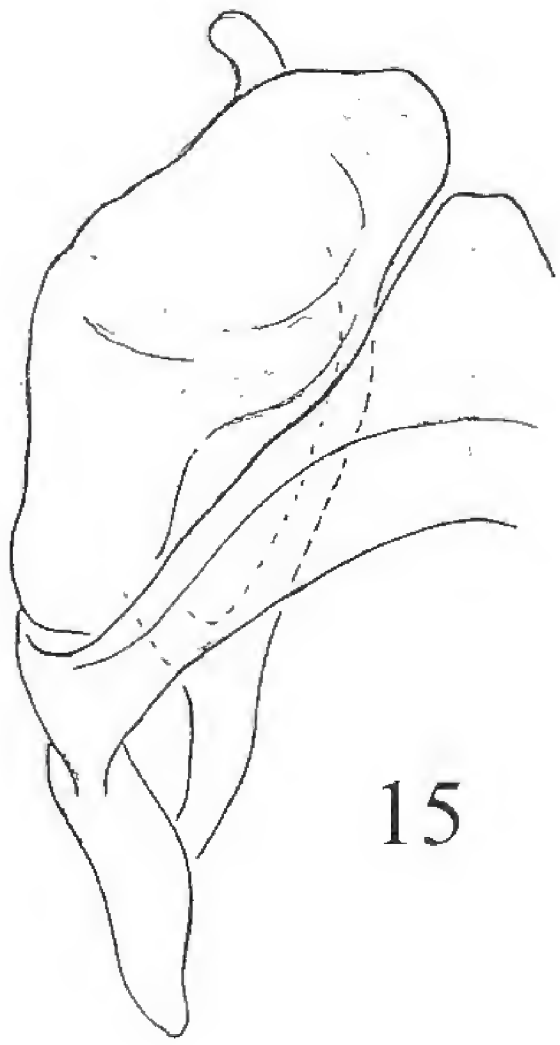
Atopetholus parvus Chamberlin, 1918, Proc. Biol. Soc. Washington, 31: 170. ♂ HT (MCZ), from Claremont, Los Angeles Co., California.

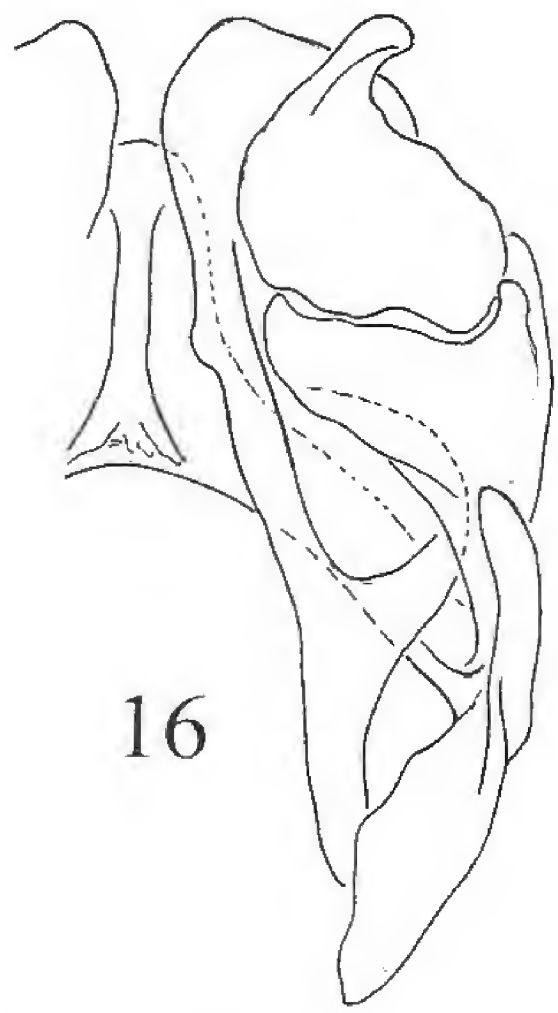
Tidolus parvus: Chamberlin, 1949, Journ. Washington Acad. Sci., 39: 169. – Hoffman & Orcutt, 1960, Proc. U. S. Nat. Mus., 111: 114.

The anterior gonopods represent the configuration typical of the Atopetholinae, with a distinct, sclerotized median sternal projection essentially continuous with the slightly arched basal sternal element (Fig. 15). Nor does this gonopod show any generic apomorphy in posterior aspect (Fig. 16). The posterior gonopod however is singular in being bent at nearly a right angle near its midlength, with a prominent bidentate lobe on its inner surface just proximad to the curvature (Figs. 17, 18).

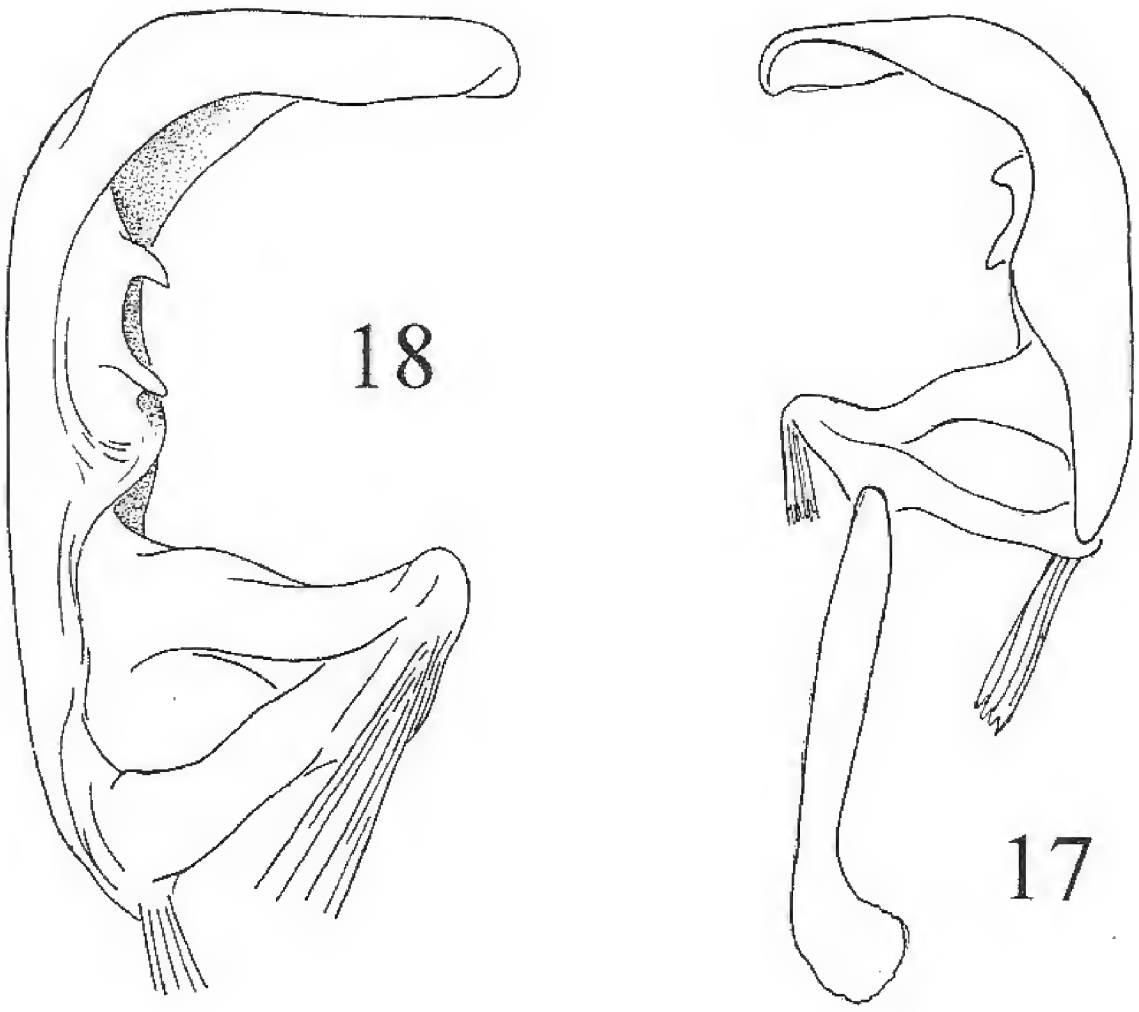
Among the documents which I inherited along with the collection of H. F. Loomis after his demise in 1976 is a complete description and gonopod drawings of a species identified (and I think correctly) as *parvus*. This information was obtained from two male specimens taken by O. F. Cook in Topango (or Topanga) Canyon, northwest of Santa Monica, California, on 30 December 1927. I have no knowledge where these specimens may be, if still extant, as they were not in the material that remained in the Loomis collection after he dispersed much of it to several museums. But I consider the illustrations accurate enough to be definitive.

Topanga Canyon is approximately 50 miles west of Claremont, suggesting that *parvus* may be/have been widespread - if sporadic - in the Los Angeles region.





Figs. 15-16. *Tidolus parvus* (Chamberlin). 15, right side of anterior gonopods, anterior aspect. 16, right side of anterior gonopods, posterior aspect.



Figs. 17-18. *Tidolus parvus* (Chamberlin). 17, right posterior gonopod, posterior aspect. 18, The same gonopod, oblique anterior aspect, enlarged. Drawings from holotype.

Genus **Toltecolus** Chamberlin

Toltecolus Chamberlin, 1943, Bull. Univ. Utah, 34(7): 27. Type species: *T. garcianus* Chamberlin, by original designation.

Centrelus [nec Cook, 1911] Hoffman & Orcutt, 1960, Proc. U. S. Nat. Mus. 111: 123. Incorrect synonymy!

One result of the re-assessment of *Centrelus* (q.v., supra) was the necessity to resurrect *Toltecolus* as the valid group name for a eureline incorrectly assigned to *Centrelus*; this had been done without explanation in the "Classification", p. 77.

The general facies of body form and posterior gonopod of both *T. kerrensis* and *T. fluvialis* strongly resemble those of *Eurelus soleatus*. Probably the single feature most supportive of separate generic status for *Toltecolus* is the occurrence of a distinct, thin fleshy flap on the anterior side of the gonocoxal apex. The development of large marginal spines on the lower metazonal margins is a relative character, probably of only specific value.

For the present I retain *Toltecolus* as a recognizable generic taxon but without the conviction that another opinion might award the same status to the two species involved.

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